



Research and Development

Application of Pollution Prevention
Techniques to Reduce Indoor Air Emissions
From Aerosol Consumer Products

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FOREWORD

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APPLICATION OF POLLUTION PREVENTION TECHNIQUES TO REDUCE INDOOR AIR EMISSIONS FROM AEROSOL CONSUMER PRODUCTS

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Abstract

Aerosol consumer products potentially are amenable to pollution prevention strategies that reformulate or redesign products, substitute raw materials, or improve consumer use procedures. A basic understanding of the behavior of aerosol consumer products is essential in the development of pollution prevention strategies, which may reduce occupant exposures and guide manufacturers in the development of more efficacious, less toxic products. This research project was undertaken to develop tools and methodologies to measure aerosol chemical and particle dispersion through space. EPA's National Risk Management Research Laboratory sponsored a cooperative agreement with the Georgia Tech Research Institute (GTRI), and the University of Illinois (UI) to develop tools and methodologies to measure aerosol chemical composition and particle dispersion through space. These tools can be used to devise pollution prevention strategies that could reduce occupant chemical exposures and guide manufacturers in formulating more efficacious products. The GTRI researchers built an Aerosol Mass Spectral Interface (AMSI), which is interfaced with a mass spectrometer (MS), that chemically characterizes aerosol consumer products through space. The UI researchers developed techniques for measuring aerosol movement indoors by tracking particle size changes via particle velocity measurements using particle image velocimetry (PIV). A group of Industry Partners participated in this research project to ensure that the technologies developed would be useful to industry.

The AMSI was designed, constructed, and optimized to transfer a focused beam of aerosol particles into a mass spectrometer for chemical analysis. It was shown experimentally during this project that the AMSI can quantitatively detect compositional changes as the aerosol travels through space. These data provide important information for the formulating of aerosol consumer products for pollution prevention strategies. The PIV system demonstrated a correlation between the material properties of the aerosol components and the spray pattern. These data were used to develop a model for prediction of the major characteristics of aerosol spray patterns. The model can be a useful guide for developing pollution prevention strategies.

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Table of Contents

Abstract	ii
List of Tables	v
List of Figures	vi
Acknowledgments	ix
1.0 Introduction	1
1.1 Background.....	1
1.2 Traditional Aerosol Analysis.....	2
2.0 Conclusions	4
2.1 Chemical Composition.....	4
2.2 Particulate Behavior.....	5
3.0 Recommendations	6
3.1 Technology Costs.....	6
3.2 Technology Limitations	6
4.0 Technical Approach	8
5.0 Methods, Results, and Discussion	9
5.1 Surrogate Aerosols.....	9
5.2 Chemical Composition.....	11
5.2.1 Aerosol Mass Spectral Interface	11
5.2.2 Generation of Standard Aerosols	13
5.2.3 Total Aerosol Consumer Product Analysis	13
5.2.4 Optimization of AMSI	17
5.2.4.1 Vacuum Applied to AMSI	17
5.2.4.2 Reproducibility	18
5.2.4.3 Skimmer Design.....	19
5.2.5 AMSI/MS Analysis	23
5.2.5.1 Particle Beam Mass Spectrometer (PBMS)	23

Contents (Cont.)

5.2.5.2 Atmospheric Triple Quadrupole Mass Spectrometer (API)	25
5.2.6 Surrogate Aerosols Analysis	26
5.2.7 Chemical Composition Change Through Space.....	35
5.2.8 Particle Size Distribution Selection for Analysis via Steering Gas	37
5.3 Particulate Spatial Dispersion	38
5.3.1 Particle Size Distribution	40
5.3.2 Aerosol Spray Cone Characterization	47
5.3.3 Aerosol Transport in Rooms	59
6.0 Technology Costs to Industry or Other Researchers	66
6.1 AMSI	66
6.2 Aerosol Spray Pattern Characterization.....	66
7.0. Quality Assurance.....	70
7.1 Project Description.....	70
7.2 AMSI Development.....	70
7.2.1 OCN Calibration.....	71
7.2.2 MS Calibration	71
7.3 PIV Analyses	71
7.3 Surrogate Aerosols.....	72
8.0 References.....	74
9.0. Appendix 1- <i>Industry Partners</i>.....	77

List of Tables

1.	Description of surrogate aerosols.....	10
2.	Peak assignments for SWP and SWA analyzed by PBMS without the AMSI.....	16
3.	Results of AMSI skimmer optimization.....	22
4.	Peak assignments for API spectra of SLS.....	27
5.	Peak assignments for APCI spectra of Butyl Cellosolve®	28
6.	Peak assignments for SWP and SWA analyzed by PBEI without the AMSI./.....	30
7.	Peak assignments for SWA analyzed by positive API with the AMSI.....	30
8.	Peak assignments for silicone-ethanol adducts.....	31
9.	Range of particle sizes of surrogate aerosols measured with Malvern particle sizer.....	41
10.	PIV determined concentration distribution of surrogate aerosol particles at a distance from the spray nozzle.....	52
11.	Aerosol particle concentration and size distribution in spray jets—PIV system costs.....	66
12.	Aerosol particle velocity distribution in spray jets – PIV system costs.....	67
13.	Aerosol particle concentration distribution in environmental chambers—PIV system costs.....	68
14.	Aerosol particle velocity distribution in environmental chambers—PIV system costs.....	68
15.	New PIV system costs for aerosol particle distribution measurement in an environmental chamber.....	69
16.	Summary of PIV system capability and accuracy.....	73

List of Figures

1.	Detailed schematic of AMSI.....	12
2.	PBMS of AA1.....	15
3.	PBMS of SWA.....	16
4.	PBMS of SWP.....	17
5.	Comparison of PBCI response of SWP with and without vacuum pump connected to AMSI.....	18
6.	Reproducibility of mass spectral response with skimmer added (AMSI Model B).....	19
7.	Different types of skimmers.....	20
8.	Comparison of SWP response with nozzle angles of 60° and 160°.....	21
9.	Optimum skimmer design schematic.....	23
10.	Schematic of AMSI coupled to PBMS.....	24
11.	Schematic of AMSI coupled to API.....	25
12.	Interface coupling AMSI to heated nebulizer assembly.....	26
13.	PBMS in CI mode spectrum of SWA.....	29
14.	API in positive mode spectrum of BC.....	29
15.	API in positive mode spectrum of SLS.....	31
16.	AMSI/PBMS in EI mode of SNW1.....	32
17.	AMSI/PBMS in EI spectrum of SNW2.....	32
18.	AMSI/PBMS in EI mode spectrum of SNWP.....	33
19.	Product A spectrum by AMSI/API in positive mode.....	34
20.	Product B spectrum by AMSI/API in positive mode.....	34
21.	SLS spectrum by AMSI/API in positive mode.....	35
22.	Detection of m/z 119 ion for SWA by AMSI/MS with increasing distance from AMSI entrance nozzle.....	36
23.	Depiction of signal intensity of m/z 119 with increasing SWA percentage.....	36

Figures (Cont.)

24.	Depiction of particle size selection via increasing steering gas flow.....	37
25.	Distance in still air penetrated by particles with an initial velocity of 2 m/s and 10 m/s.....	38
26.	Settling velocities for particles suspended in air.....	39
27.	Steady state velocities of particles affected by gravity and different air velocities opposite to the direction of gravitational field (upward velocity is positive).....	39
28.	Schematic of Malvern Particle Sizer for droplet size measurement.....	41
29.	Particle size distribution measured with Malvern analyzer for surrogate air aerosols.....	42
30.	Particle size distributions measured with Malvern analyzer for surrogate surface non-wipe aerosols.....	42
31.	Drop size distributions for SWA and SWP measured with Malvern system.....	43
32.	Depiction of spray cone particle-size distribution measurement scheme.....	43
33.	Particle size distribution for AA1 at increasing distance from laser beam.....	45
34.	Particle size distribution for SWA at increasing distance from the laser beam...	46
35.	Velocity decay of surrogate aerosol particles along the jet centerline.....	47
36.	Sauter Mean Diameters correlated with distance from the spray.....	48
37.	Particle size distribution related to can-fullness.....	49
38.	PIV measurement system.....	50
39.	Schematic of beam sweeping over aerosol particles.....	50
40.	Particle size distribution small view field schematic.....	51
41.	Particle size distribution large view field schematic.....	51
42.	Contour plots of aerosol particle concentrations.....	53
43.	Surrogate aerosol particle concentration profiles along the radius of the spray cone.....	54
44.	Velocity measurement interrogation system hardware schematic.....	55
45.	Surrogate aerosol particle velocity distributions along the axis of the spray nozzle.....	56

Figures (Cont.)

46.	Test room for ventilation simulator.....	60
47.	PIV/environmental chamber system schematic.....	61
48.	PIV/environmental chamber measurement system schematic.....	63
49.	Vector map of instantaneous room air velocities at an air change rate of 5 ACH.....	63
50.	Contour plot of instantaneous particle concentration at an air change rate of 5 ACH.....	64
51.	Normalized particle concentration in environmental chamber with a circular diffuser distributing the air.....	65

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